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**PROGRESS REPORT OPERABLE UNIT 4 - SILOS  
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Environmental Management Project

# Remedial Investigation/ Feasibility Study

PROGRESS REPORT

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OCTOBER 1993

## Operable Unit 4 SILOS 1 - 4

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### Introduction

The Remedial Investigation/Feasibility Study is the blueprint for cleanup at the U.S. Department of Energy's Fernald Environmental Management Project. The nature and extent of contamination at the Fernald site and surrounding areas is being thoroughly investigated so that appropriate remedial actions can be formulated and implemented.

The Fernald site has been divided into five sections, known as Operable Units, for environmental investigation and cleanup. The Operable Units were defined based on their location or the potential for similar technologies to be used in the ultimate cleanup.

During the course of the RI/FS effort, certain conditions are occasionally identified which call for more immediate action. These actions are called "removal actions" and are initiated when there is a need to accelerate cleanup activities to address releases or potential releases of hazardous substances.

At the present time there are no removal actions taking place in Operable Unit 4. Three removal actions were successfully completed in November 1991 (bentonite installation in Silos 1 and 2); April 1991 (decant sump tank); and January 1992 (Silo 3 hopper and assembly removal). All removal actions at Fernald are coordinated with the U.S. EPA and the Ohio EPA.

Following is a progress report on Operable Unit 4 including its history, the current status of RI/FS activities, and cleanup alternatives under consideration.

### Background

K-65 Silos 1 and 2 contain radium-bearing radioactive wastes dating back to the 1940s. The two silos were reinforced with an earthen berm in 1964, and

the berm was upgraded in 1983. Other past improvements included a 30-foot cap which was installed on top of the silo domes for added protection, and a polyurethane foam coating that was applied over the domes for weather protection. A Radon Treatment System (RTS) was constructed, and radon gas monitors were installed around the Fernald site boundary and in the immediate vicinity of Silos 1 and 2. Silo 3 contains dried uranium-bearing wastes, and Silo 4 is empty.

### RI/FS Activities

**Site Characterization:** All initial site characterization activities associated with the Operable Unit 4 RI/FS have been completed. Data from the analyses of collected samples has been received and validated. The data has been compiled for use in the Remedial Investigation and Feasibility Study reports. Field activities included the completion of borings in the berms surrounding the silos, the soils beneath the silos, and the contents of the concrete structures. Above background concentrations of radionuclides and other contaminants have been identified in surface and subsurface soil, sediment and surface water, and groundwater within and adjacent to the Operable Unit 4 study area.

**Reports:** The Remedial Investigation (RI) Report for Operable Unit 4, including all validated analytical data from sampling activities, was conditionally approved by the U.S. EPA and Ohio EPA in October 1993. The RI Report provides details about the nature and extent of contamination in Operable Unit 4 and establishes remedial action objectives. The report also includes a Baseline Risk Assessment for Operable Unit 4. This Baseline Risk Assessment evaluates the pathways of exposure and the extent of exposure for existing conditions prior to any reme-

dial activities in Operable Unit 4. Based on the results of the site investigations and risk calculations, the risks associated with Operable Unit 4 exceed generally-accepted regulatory thresholds, thereby necessitating the implementation of remedial actions.

Viable remedial action alternatives are evaluated in the Operable Unit 4 Feasibility Study (FS) Report, which was submitted to the U.S. EPA ahead of schedule on September 9, 1993. Fernald's Sitewide Environmental Impact Statement (EIS), which addresses requirements of the National Environmental Policy Act (NEPA), was integrated into the FS with the NEPA Cumulative Impact Analysis was issued as an appendix. The Sitewide EIS evaluates the leading remedial alternatives for all five Operable Units and the environmental impacts associated with them. The intent was to issue the first FS Report as an integrated document that satisfies both NEPA and CERCLA, to be called a Feasibility Study/Environmental Impact Statement.

In support of the FS development, two treatability study programs were completed. One Treatability Work Plan approved by the U.S. EPA evaluated cementation and chemical extraction technologies for Operable Unit 4 wastes.

The cementation study involved the evaluation of different cement and additive formulations, focused on producing the best mix design which retards contaminant migration and provides acceptable physical properties such as volume and strength. Testing for durability, radon emanation, and radon leaching, also was completed. Results indicate that cementation is a viable alternative; however, the resulting waste volume is as much as triple its original volume.

The chemical extraction portion of the study focused specifically on the potential for removing certain radionuclides and heavy metals from the K-65 residues through acid/solvent digestion and extraction techniques. Testing for radon emanation and radon leaching of the vitrified waste stream, which contains the bulk of the radionuclides and heavy metals, was completed. The remaining waste stream would require treatment prior to final disposition, due to the presence of elevated levels of radionuclides and heavy metals.

The second Operable Unit 4 Treatability Study Work Plan examined vitrification of the waste materials from Silos 1, 2, and 3. Samples of materi-

als in the silos were transferred to the Battelle Pacific Northwest Laboratory in Richland, Washington, where the tests were performed.

Vitrification test results appear to be favorable in achieving significant waste volume reduction and retarded contaminant migration.

Results of both treatability studies are contained in the Operable Unit 4 FS Report. These technologies were tested to provide information to support the determination of which technology provides the most environmentally-sound, cost effective and implementable method for treating the wastes prior to final disposal. DOE anticipates comments from the U.S. EPA and Ohio EPA on the FS Report in November 1993.

DOE also submitted its Proposed Plan for Remedial Action for Operable Unit 4 to the U.S. EPA in September 1993. In the Proposed Plan, DOE identifies an initial preference for vitrification of the contents removed from Silos 1, 2, and 3 and the decant sump tank sludge, followed by off-site shipment of the vitrified material for disposal at the Nevada Test Site. Demolition debris from the silos and contaminated soils excavated in the vicinity would be stored at Fernald on an interim basis, in a manner consistent with the approved work plan for Improved Storage of Soil and Debris (Removal Action No. 17).

## **Other Activities**

### **Minimum Additive Waste Stabilization:**

Activities in support of the Minimum Additive Waste Stabilization (MAWS) program were restarted September 30, 1993, a month after MAWS equipment was shut down as a result of an incident in which a subcontractor employee received burns from a flash fire.

The incident occurred August 30, 1993, while glass gems were being made in Plant 9 during the equipment-test phase of the program. The operator erroneously sprayed an aerosol graphite compound onto a steel plate used to catch molten glass to form gems. The operator thought applying graphite would improve the operation. However, the aerosol propellant was drawn into the melter unit and caused ignition and a flash fire. The operator was treated at a local hospital and released.

As a result, FERMC0 shut down MAWS equipment to reassess the program's operating and

safety protocols, and implement appropriate corrective actions.

In October 1993, MAWS equipment will be tested at the desired capacity to prove the MAWS system fully operational. Glass gems have been produced successfully at Fernald from a batch of simulated (non-contaminated) waste.

The MAWS program combines vitrification (transforming waste into glass), water treatment and soil decontamination processes. MAWS equipment at Fernald includes a soil decontamination unit, a melter with an off-gas system, and a water treatment system.

The MAWS program is designed to blend waste materials with contaminated soils and, through the use of electricity, melt them into a stable glass form which is safe for permanent disposal. This process yields three effluent streams: 1) clean water; 2) clean soil, and 3) glass.

The soil decontamination process separates contaminated soils into clean and contaminated portions. The contaminated portion is blended with other wastes (such as Fernald pit wastes) and melted into a stable glass form. The clean portions can be used as excavation backfill as needed at Fernald.

## Cleanup Alternatives

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Several cleanup alternatives have been identified for Operable Unit 4. The alternatives include: 1) stabilizing and capping the waste in place; 2) removing and stabilizing/treating the waste with disposal in an engineered facility on Fernald site property, and 3) removing and stabilizing/treating the waste and shipping it to an approved off-site disposal facility.

**Remedial Design:** Conceptual design engineering has been initiated for Operable Unit 4 for purposes of establishing preliminary design parameters and cost estimates. Conceptual engineering is proceeding based upon adapting representative remedial action alternatives for Silos 1, 2, and 3, as identified in available RI/FS documents. Conceptual engineering is proceeding in parallel with the RI/FS to allow for the prompt implementation of remedial action following issuance of the Record of Decision for Operable Unit 4.

More information about Operable Unit 4 is available in the Public Environmental Information Center (PEIC), where Fernald Project cleanup documents are kept in the Administrative Record. The PEIC is located in the JAMTEK building, 10845 Hamilton-Cleves Highway, Harrison, Ohio, 45030. The telephone number is (513) 738-0164.